

Clinical Overview

Tuberculosis

Tuberculosis (TB) is caused by *Mycobacterium tuberculosis* or *M. tuberculosis* and is transmitted when a person inhales airborne infectious droplet nuclei produced by a contagious individual who talks, sneezes, and/or coughs. TB risk factors include residence in a community where TB is prevalent, homelessness, substance abuse, incarceration, and certain medical conditions such as human immunodeficiency virus (HIV) infection and diabetes. The presence of infectious TB cases in the population results in the continuous transmission of this disease and the development of new cases of TB. Individuals infected with TB bacillus who do not receive adequate treatment are at risk of developing active disease. Although risk of developing active TB is highest soon after infection, the overwhelming majority of new TB cases occur in persons infected many years prior to the onset of disease. It is estimated that about one in twenty of the total population in Texas is actually infected with the TB bacillus, but most people's immune system prevents the development of the disease, so that there is only about a 10% lifetime chance of developing TB disease for those who are infected.

Drug resistant TB is an important problem in the field of TB control. Any TB strain that is resistant to both isoniazid (INH) and rifampin (RIF), the first line drugs used to treat the disease, is classified as multiple-drug resistant TB (MDRTB). The treatment of TB without the use of INH and RIF poses a major challenge to health care providers and patients alike in terms of available medication regimens for treatment, the length of therapy, and the cost. Without proper medical management using prescribed treatment plans, manageable TB can become drug resistant, and can be spread to uninfected persons. When drug-sensitive TB is properly diagnosed and persons are placed on proper treatment, usually within a few weeks they become non contagious and can resume normal activities provided they continue proper treatment.

Directly Observed Therapy (DOT) is the standard of care for all TB cases and requires that each dose of TB medication be taken by the patient while being observed by a responsible person. DOT can be accomplished in any setting, whether the medication is issued in a clinic, in a hospital, at home, in jail, or even on the street. DOT improves the cure rate for TB and reduces the incidence of drug-resistant TB.

TB in the United States

According to the most recent TDH annual report, the number of active cases of TB reported in 1996 for the US population was 21,337 for a case rate of 8.0 per 100,000 population. This was down from the 1995 caseload of 22,860 with a case rate of 8.7 per 100,000. States with the highest case rates were in order: Hawaii; Alaska; New York; California; and Texas. The race/ethnicity statistics for the 1996 caseload were as follows:

<u>Cases</u>	<u>% of Total</u>	<u>Case Rate Per 100,000</u>
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White	5,506	25.8	2.8
Black	7,106	33.3	22.3
Hispanic	4,533	21.2	16.0
Asian/Pacific Islander	3,814	17.9	41.6
Other	378	1.8	14.5
Total	<u>21,337</u>	<u>100.0</u>	<u>8.0</u>

TB Providers in United States

Only some states maintain entire hospital facilities dedicated to the treatment of tuberculosis today. In a survey of several states (California, New York, Florida, Georgia, Illinois, Missouri and Michigan), four have state hospitals dedicated at least in part to tuberculosis. Florida maintains a 50-bed facility dedicated to tuberculosis, New York City (which receives separate CDC funding from New York State) has thirteen beds, California has 20 beds in Northern California with more authorized for Southern California in 1998, and Missouri maintains one wing in a hospital formerly dedicated totally to tuberculosis. A few other less populous states, such as Utah, South Carolina, and Colorado, maintain TB services with dedicated beds in hospital units. For states that do not handle inpatient tuberculosis through dedicated state hospitals, responsibility appears to fall at the local private or public hospital level (county, city, or tuberculosis sanitarium district) for the treatment of tuberculosis and financing of services.

As previously indicated, Texas has three partially or wholly dedicated state hospitals with special units and programs specifically prepared to treat TB.

The following describes TB hospitals in some of the surveyed states:

Florida (9.8 cases per 100,000): A.G.Holley State Hospital, Lantana.

- This facility began as a TB sanitarium with 600 beds; currently it operates 80-85 beds devoted to TB, chest disorders and AIDS patients.
- The facility has an average length of stay of 90-100 days.
- Some minor outpatient surgical procedures are performed. Most major surgeries are referred to the county hospital.
- Medicare and Medicaid comprise the primary source of reimbursement for services, as well as state appropriations.
- Patients are referred from other county facilities and are admitted for treatment after going through a screening process.
- The current referral base includes all of the 67 counties in the state.

New York (14.2 cases per 100,000): State TB Division and New York City

- There are no state owned TB hospitals in New York State (However, since 1993 New York City has a thirteen bed locked unit for TB at Goldwater Hospital.)

- **The State TB Division is responsible for:**
 - **Monitoring quality of care given by county facilities.**
 - **Educating the public about TB.**
 - **Compiling data as to the incidence of TB in the state.**
- **The county covers the expenses of a TB patient unable to obtain any other third-party reimbursement.**
- **The State reimburses the county for 50% of the cost of care for TB patients.**
- **County-state funds cover inpatient care for six weeks. Any patient requiring a longer stay must be reviewed by the county TB Control Officer. If necessary, the State Health Commissioner determines if the additional stay is medically necessary.**
- **The state of New York receives funds for intermittent drug therapy provided by County Outreach Programs through the Center for Disease Control in Atlanta.**
- **All state TB sanitariums were converted to other types of healthcare facilities.**
- **The state has exercised its option under OBRA 93 to create a new Medicaid eligibility class for TB infected persons. This permits coverage of outpatient services for these individuals at the SSI level.**
- **New York City's TB Control Program receives separate CDC funding support from the State.**

Illinois (8.9 cases per 100,000): State TB Division and Chicago TB Control Agency.

- **There are no state owned TB hospitals in Illinois.**
- **Illinois counties and all metropolitan areas are served by TB Control Agencies.**
- **The Chicago area applies for grants from the Centers for Disease Control and Prevention (CDC) separately from the rest of the state of Illinois.**
- **The state TB Coordinator is responsible for:**
 - **Monitoring the TB Control Agencies.**
 - **Collecting statistical data on the incidence of TB.**
 - **Educating the general public and the medical community on TB.**
- **Approximately eighty-three percent of the TB patients are admitted under another diagnosis. They are later diagnosed as having TB and referred to the appropriate TB Control Agency.**
- **Inpatient treatment is approximately two weeks. Upon discharge, the patient**

works with the TB Control Agency to determine whether the Agency will administer the remainder of his care/medication or whether a private physicians will be responsible.

- TB care for indigent inpatients is provided by Cook County Hospital. The outpatient care is provided by the CDC-designated TB Control Agency.

Colorado (2.7 cases per 100,000):

- National Jewish Medical and Research Center (NJMRC) in Denver provides consultative and direct inpatient services for patients with TB and MDRTB.
- NJMRC provides national reference laboratory services, including extended susceptibility studies on TB isolates and comprehensive serum concentration and applied pharmacokinetics for drugs used to treat TB and MDRTB.
- Limited inpatient capacity (fewer than 20 beds) is maintained at the Center.
- Accepts some funded inpatient referrals from other states, mostly for management of MDRTB.
- Conducts a nationally recognized TB course for physicians and other health care providers; one of the CDC-accredited National Centers of Excellence for TB education and research.

Massachusetts (4.3 cases per 100,000):

- Eighteen beds at the Lemuel Shattuck Public Health Center in Boston are available for long-term treatment of TB patients from throughout New England.
- Utilization of Shattuck Center services was evaluated in a New England Journal of Medicine article, September 1997.
- All medical care services for TB patients are available at the Shattuck Center. Most TB care is managed by DOT in local communities, but hard-to-treat cases are referred to the Shattuck Center.
- Quarantined cases are referred to home-based involuntary commitment or referral to the Shattuck Center for involuntary hospitalizations.
- Clinical residents and fellows from Tufts and Harvard Medical Schools staff the Shattuck Center program.

California (13.5 cases per 100,000):

- **TB cases are managed by local jurisdictions.**
- **A nationally accredited Center of Excellence, the Francis J. Curry National Tuberculosis Center, is located at the University of California-San Francisco.**
- **Statewide reimbursement is through the MediCal TB Program and fee-for-service for DOT.**
- **The Northern California program is anticipated to be joined by a statewide unit for Southern California.**

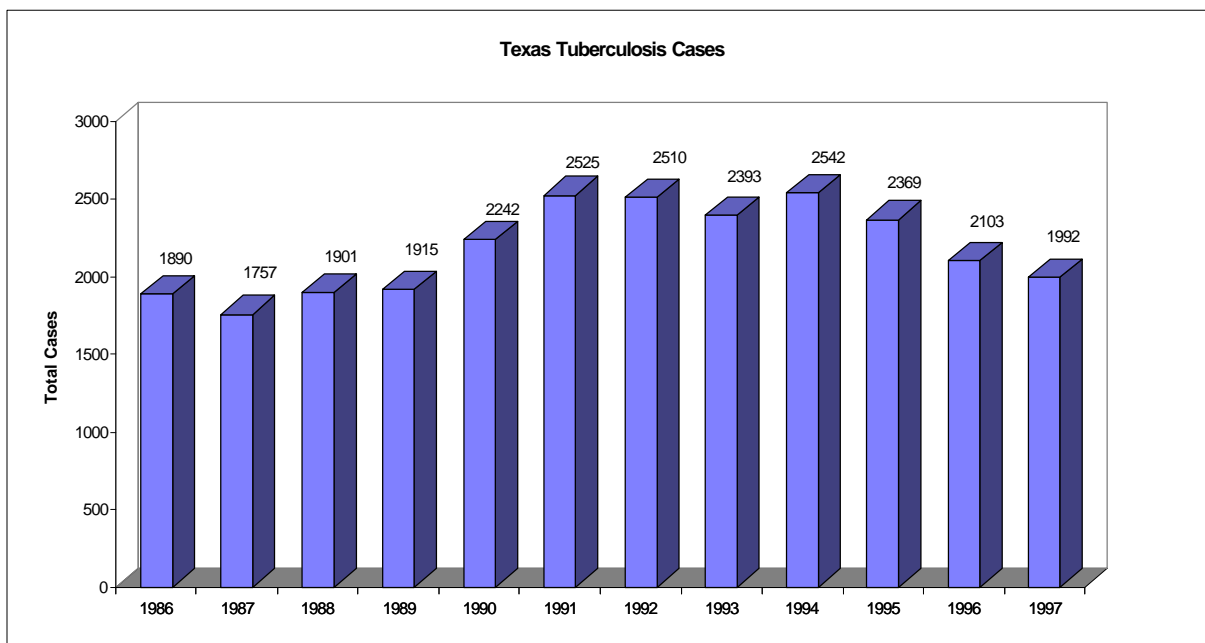
Example of How TB Care is Provided in Various States

State	Public Hospital Dedicated to TB	How is the Public TB Hospital Funded	Inpatients and Quarantine If No Public TB Hospital
California	Yes, Cordilleras Mental Health Center-20 beds	State general revenue and Medicaid	TB cases are handled by local jurisdictions with State TB unit as backup. The counties receive state TB Control funds and federal CDC funds and can bill Medicaid. Local TB controller/health officers are responsible for TB quarantine issues.
Florida	Yes. One state hospital dedicated to TB-50 beds	State General Revenue Fund. Third party collections.	NA
Georgia	No.(Hospital was closed in June 1996.).	NA	TB inpatient and quarantine needs are handled by state's 19 health districts, which contract with local hospitals to provide TB care. Each contracted hospital has respiratory isolation capacity
Illinois	No State Hospital Cook County Unit, Chicago	NA	Costs for inpatient TB are absorbed at the local level. There are county tuberculosis sanitarium districts and municipal authorities that provide services for residents under certain conditions.
Michigan	No	NA	Certain hospitals provide TB treatment and are utilized by local (county) health departments. Court-ordered commitments can be made to some of these that have locked-room capabilities.
Missouri	Yes, State hospital with one wing devoted to TB.	Until 7/1/96 the hospital was operated and funded by the state (general revenue) but is now operated by the University of Missouri. All TB beds are paid for with general revenue, in addition to third party collections. Court-ordered quarantine patients sent here.	NA
New York	No State Hospital. NYC-Goldwater Hospital-13 beds	NA	The state handles TB inpatient needs through Medicare, Medicaid or direct billing to local health departments. Courts and local health jurisdictions have authority in quarantine cases.
Massachusetts	Yes - 18 Bed Unit at Lemuel Shattuck Hospital in Boston, a state public health hospital.	State General Revenue Fund and Third party collections	NA
Utah	Yes, University	Medicaid and State General	NA

	Hospital, Salt Lake City-4 beds	Funds	
Colorado	Yes, National Jewish Medical and Research Center, Denver-20 beds	Medicaid and third party collections	NA
South Carolina	Yes, Burns Medical Center	Medicaid and State General Revenue Funds	NA

TB in Texas

The statistical and caseload data in this section has been compiled and provided by the Texas Department of Health or by the Centers for Disease Control and Prevention. Both 1996 and 1997 data are used, reflecting the latest reported information. Where 1996 data are used, a similar relationship may be presumed for 1997 usage of the data.



TB Case Volume Demography

From 1970 through 1980 TB cases reported in Texas decreased an average of 3% per year. However, TB cases began to increase in the mid-1980's continuing until 1994, when the number of cases reached a 20-year high of 2,542 and a case rate of 12.7 per 100,000 population.

In 1997, 1,992 cases of TB were reported (10.3 per 100,000 population), compared with 2,103 cases in 1996 and 2,369 cases in 1995. Ten counties (Bexar, Cameron, Dallas, El Paso, Harris, Hidalgo, Nueces, Tarrant, Travis, and Webb) accounted for 74.6% of the TB cases reported in 1996.

Fifty-seven percent of the 1996 TB cases (in the latest reported TDH data) were in 8 cities in Texas with populations greater than 250,000, including the top four cities of Houston (586 cases - 28% of state total); Dallas (204 cases - 9.7%); San Antonio (120 cases - 5.7%); and Austin (86 cases - 4.1%). (The other cities were Corpus Christi, El Paso, Ft. Worth, and Arlington.) Another area of high case rates in addition to the large metropolitan areas is the Texas-Mexico border area consisting of the counties of Brewster, Cameron, El Paso, Hidalgo, Hudspeth, Jeff Davis, Kinney, Maverick, Presidio, Starr, Terrell, Val Verde, Webb, and Zapata. These counties had a 1996 caseload of 327 cases with a rate of 18.0 per 100,000 population.

Age, race, gender and ethnicity characteristics for 1996 TB cases in Texas are as follows:

Age (Years)	Total	Total All Races		White		African American		Hispanic		Asian or Pacific Islander		Native American	
		M	F	M	F	M	F	M	F	M	F	M	F
0-19	200	106	94	6	7	31	23	58	56	9	8	2	0
20-64	1,513	1,080	433	262	91	317	117	412	181	88	42	1	2
65 +	390	235	155	78	43	37	28	101	68	19	16	0	0
Total	2,103	1,421	682	346	141	385	168	571	305	116	66	3	2

Leading TB Risk Factors

The top six risk factor categories for TB cases reported in Texas in 1997 were:

- 1. foreign born (at least 32% of cases in 1997);**
- 2. substance abuse (17% of 1997 cases);**
- 3. HIV/AIDS (10.7% of 1997 cases);**
- 4. diabetes (10% of 1997 cases);**
- 5. prison/jail (12% of 1997 cases);**
- 6. homelessness (6.7% of 1997 cases).**

Note that persons with TB may have more than one key risk factor.

Tuberculosis, AIDS and HIV Infection

Although the AIDS case definition was revised in 1993 by the Center for Disease Control to include HIV-infected persons who have either pulmonary or extra-pulmonary TB, a review of 1988 TB case reports identified that 5.5 percent of the TB cases reported were co-infected with TB and HIV. In 1996, 11.7% of all reported Texas TB cases were known to have AIDS which was the third leading risk factor of tuberculosis cases in Texas. Texas TB data confirms the epidemiologic surveillance data from the Centers for Disease Control and Prevention (CDC) which has suggested an association between tuberculosis and the Acquired Immunodeficiency Syndrome (AIDS).

Since 1985, the number of cases with AIDS have continued to rise. This trend is believed to be largely related to the continued rise in the epidemic of HIV infection and AIDS in the country. In the last four years, though, the number of recognized TB cases in Texas with HIV infection or AIDS have decreased from 353 cases in 1993 to 247 in 1996. The decrease in TB AIDS cases is not related to the change in case definition, which would have increased the TB-AIDS count. The decrease could be attributed to decreased HIV prevalence of improved treatments for AIDS. However, the risk of developing active TB among persons with tuberculosis infection (positive TB skin test but negative x-ray) and HIV infection is many times higher than for persons with tuberculosis infection without HIV infection.

Tuberculosis in Foreign-born Populations

An estimated one-third of the world's population has tuberculosis infection or non-infectious tuberculosis. Of the 1996 Texas TB cases, 31% of the patients were known to be foreign-born of which Mexican-born accounted for 60% of the total foreign-born cases. Immigrants from 47 other countries comprised the remaining foreign-born TB patients. The majority came from Vietnam (66), the Philippines (27), India (23), Honduras (21), El Salvador (17), South Korea (9), Guatemala (8), and Pakistan (7).

These cases, though foreign-born, arrived in the U.S. anywhere from a few days to more than eighty years before being diagnosed with TB. Recent arrivals, defined here as individuals arriving in the United States less than one year prior to the initiation of therapy, accounted for 27% of all foreign-born TB cases as compared to seven percent of all cases. Approximately ten percent of all TB cases identified as recent arrival cases were refugees who were diagnosed during screening upon arrival.

During 1996 Texas received 3,869 refugees, accompanied immigrants, parolees, and asylees from 43 countries. The majority came from 5 countries: Vietnam (1470), Bosnia (696), Iraq (464), Somalia (387) and Cuba (309). Of these, 3,030 underwent tuberculosis screening. Of this number, 40 percent had a positive skin test. Evaluation of these positive reactors resulted in 70 (2% of those screened) being given treatment for TB disease and 596 (20%) being placed on preventive therapy.

There are factors affecting the need for TB services in the Texas-Mexico border counties which include:

- Large growth in population of the border region during the last 20 years which has strained local resources to meet public health needs in the area.
- Increasing numbers of people crossing the border each year, legally and illegally.
- Growth of the *maquiladora* industry which employs thousands of workers on both sides of the border
- Dual residency and shared families; family members living on both sides of the border present difficulties in terms of TB epidemiology and treatment.
- Low tax base with low budgets for local public health services

Drug-Resistant Tuberculosis

Drug-resistant tuberculosis is a major problem for TB control. Any *mycobacterium tuberculosis* strain that is resistant to both isoniazid (INH) and rifampin (RIF) is classified as multidrug resistant tuberculosis (MDRTB). The treatment of TB without the use of INH and RIF is a major challenge to health care providers and patients, because multiple potentially toxic medications must be given over a prolonged course of therapy.

In Texas there were 21 reported cases of MDRTB during 1996. Of these cases, 18 were foreign-born (12 from Mexico, 2 from India, 2 from the Philippines, 1 from Korea and 1 from Dominican Republic); 10 reported previous TB therapy in their country of origin, and 7 were reported within 90 days of arrival to the United States. At the time of reporting, the average number of drugs to which cases of MDRTB were drug resistant was 4.5 drugs. During 1996 there were 320 drug resistant TB cases under management in Texas.

By comparison, there were 13 MDRTB cases reported in 1995 and there were 327 drug resistant TB cases under management. According to clinicians, average lengths of stay tend to be longer for persons with MDRTB when inpatient hospitalization is necessary as treatment regimens are complex and have side effects similar to cancer chemotherapy. The growing number of MDRTB cases in Mexico, especially those in the border regions, is a major concern to controlling TB in Texas. In addition, surgery may be needed to improve the chance for a cure. Even when MDRTB can be cured, this is expensive: the cost is estimated at \$250,000 or per case compared to about \$7,500 to cure a case of drug susceptible TB.

Quarantine Patients

Local health authorities have the power to exercise several control measures in their jurisdiction. If an individual does not comply with the written orders of TDH or a local health authority, and the individual is infected or is reasonably suspected of being infected with a communicable disease, that individual may be subject to court orders for quarantine. Under the current law, at the request of the local health authority or TDH, a municipal, county or district attorney may file a sworn written application for a court order for the management of a person with a communicable disease. Currently, TCID is the state facility that accepts court-ordered TB commitments. TCID has 18 beds allocated for court ordered quarantine patients. In 1997, there was an average of two court ordered admissions per month resulting in an average daily census of approximately 15 court-ordered patients.

Research

The Clinical Investigation Department at TCID performs biomedical research in six projects in tuberculosis and a fungal disease, coccidioidomycosis, and is supported by grants from the Centers for Disease Control and Prevention, National Institutes of Health, and private foundations. One project is to serve as a reference laboratory for performing DNA fingerprinting of tuberculosis investigations by the TDH TB Elimination Division. Results are used to identify the source case and track the spread of the disease throughout the State. Another grant has two years of funding from the Kleberg Foundation for a collaborative study with the staff at South Texas Hospital to investigate the spread of multidrug resistant tuberculosis along the Border.

The Research Laboratory is also evaluating the utility of molecular techniques for rapid identification of tuberculosis isolates that are resistant to the first-line drugs, isoniazid (INH) and rifampin (RFP). A fourth grant focuses on the fungal disease coccidioidomycosis, which is highly endemic in Southwest Texas. The NIH awarded a three-year grant to delineate the immunoregulatory mechanisms in coccidioidomycosis and develop procedures for potentiating host defense by treatment with cytokines.

An additional five-year grant from the NIH was recently awarded to this project to identify and molecularly clone antigens of the fungus which can be used as diagnostic aids. This project has been underway for four years, during which time recombinant antigens were

developed for detecting serodiagnostic antibody response and for evaluating the immune status and prognosis of the patients. Funding has also been received from the California Health Care Foundation to develop a vaccine for in coccidioidomycosis. The Investigational Review Board (IRB) for TCID is the IRB at the University of Texas Health Science Center - San Antonio.

Tuberculosis Education Center at Texas Center for Infectious Disease

In order for the tuberculosis elimination program in Texas to achieve success in the treatment and management of tuberculosis cases, CDC funds a program so health care workers in the State can be provided with up-to-date training on TB. Professionally designed courses are held on a scheduled basis in several locations statewide for all disciplines of health care workers. The tuberculosis medical consultant heading the TB Education Center has an active role in establishing guidelines and policy for physicians to follow in treating tuberculosis cases, multidrug resistant cases, and their contacts. The consultant is one of the primary medical authorities in the State on tuberculosis, offering consultation services to practicing physicians on request.

Migration Effect on Texas' TB Management

As a border state, Texas faces unique challenges with regard to tuberculosis control. The prevalence of tuberculosis in the Texas-Mexico border region poses one problem; however the complex issue of managing multiple-drug resistant TB as a trans-border health problem is another major challenge facing Texas. World Health Organization estimates cited by a General Accounting Office study from 1995 indicate that tuberculosis rates in Mexico of 110 per 100,000, compared to the U.S. rate of 8.7 per 100,000. Mexico is also cited as one of the countries least in compliance with Directly Observed Therapy programs. The proximity with Mexico and the long history of personal and commercial relationships have lead to a border where travel, commerce, and immigration between Texas and Mexico are closely entwined.

Recent efforts to work cooperatively with Mexican health entities to ensure adequate coverage of tuberculosis control programs across the border have resulted in binational memorandums of understanding between Texas and Mexican states of Tamaulipas, Coahuila, and Chihuahua. The states agree to strive for the attainment of certain goals: 1) the formation of binational tuberculosis steering committees; 2) the establishment of a formal mechanism for case referral and contact follow-up between the Mexican states and the United States; 3) providing specific types of treatment in Mexican clinics, developing reporting systems, (and ensuring that information shared between countries regarding tuberculosis patients is kept confidential); and 4) establishing training programs for tuberculosis workers, and generally coordinating antituberculosis efforts.

According to the Texas Department of Health (TDH), when patients from the binational program are admitted into a TDH hospital, a financial and residency evaluation is completed. If a patient cannot prove Texas residency, the patient is classified as a "self-pay patient". The

definition of Texas residents in the statute does not refer to federal definitions of legal status in the United States, but to such concepts as physical presence in the state. A "resident", as defined by the State, intends to make Texas his or her home, and is not in the state temporarily. Proof of residency may include documentation, such as a Texas Driver's License, presence of personal effects in the state, or employment in the state.

Patients who have been determined not to be Texas residents are informed that upon discharge, they are fully responsible for payment for services rendered. According to TDH, these accounts are often uncollectable due to the financial status of the patients and their binational status.

Twenty-Year TB Caseload Projections in Texas

According to the Bureau of Communicable Disease Control at TDH, the number of tuberculosis cases in the United States has fallen by an average of about 5% per year. Texas has generally followed the national trend, although early in this century there were probably discrepancies as persons with TB migrated into the state because it was thought to have a healthy climate for TB, and because of population growth in the state. However, since 1953, when national reporting of TB cases was instituted, the trends in Texas have closely paralleled those of the U.S. In particular, until 1987, TB cases in Texas were falling by nearly 5% per year.

From 1987 to 1992, there was a rapid increase in the number of cases, by 42 percent or about 8.5 percent per year. This trend was seen nationally as well. This increase was unprecedented in the U.S. and reflected a change in the epidemiology of TB. Since 1994, though, control of TB appears to have been restored, and a declining number of cases is being seen.

It must be pointed out that there are several implicit assumptions embodied in the methodology, any of which could affect the accuracy of this forecast. It is assumed that the rate of population growth in Texas remains constant, and that the proportion of the various racial/ethnic groups and of foreign-born persons changes at the same rate as historical numbers. Furthermore, the model does not account for the possibility of a cure for AIDS, or of the possibility of relapse of AIDS cases in large numbers, who are currently being well controlled on the modern combination drug therapies. If a cure for AIDS is found, the projections are probably too high. If any of the other assumptions prove wrong, then Texas will probably experience more cases than are projected here.

Assumptions - Texas

A projection of data spanning the 1987 (or earlier) to 1997 period will not be valid, for it encompasses three different epidemiologic patterns of TB. Only data from 1992 forward is used for projection, since this time frame shows TB morbidity falling consistently, and covers the time frame when all programmatic responses to the epidemic were instituted.

During this time, separate trends were seen for foreign-born cases and U.S. born cases. Foreign-born cases have increased by about 16 cases per year, while U.S. born cases have decreased. The increase in foreign-born cases probably represents both continuing transmission of disease in communities in Texas, but also immigration from high incidence countries, particularly Mexico, from which over 50% of Texas' foreign-born cases come. The increasing number of foreign-born cases is projected to continue for the duration of the forecast period.

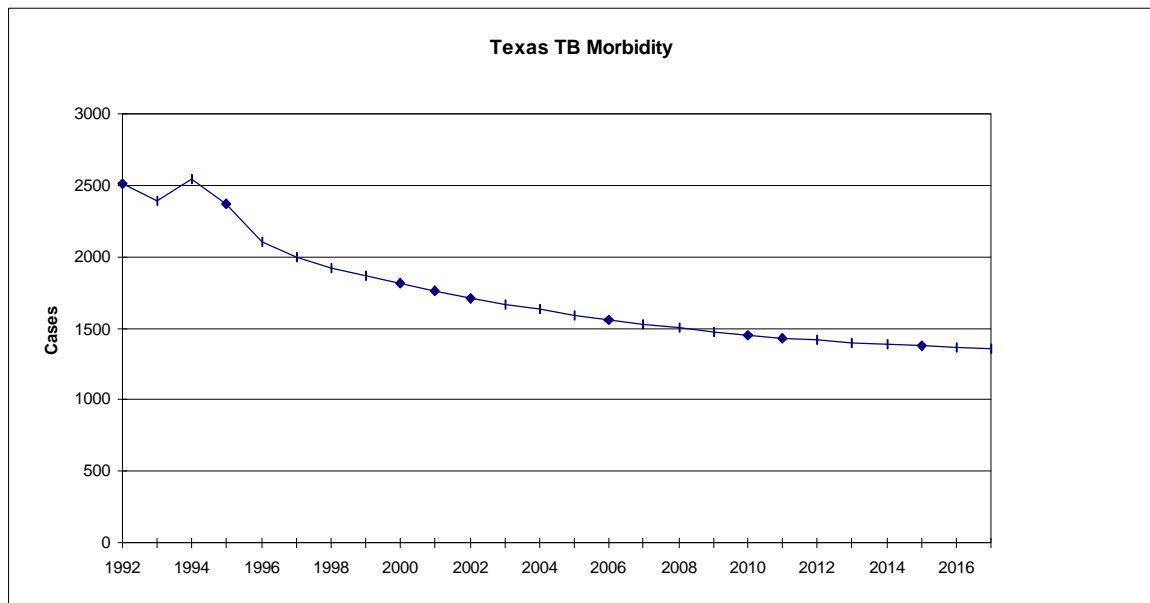
The U.S. born cases are assumed to be falling exponentially, as would be expected on the trailing edge of an epidemic.

Methodology - Texas

Because the trends in the two populations of cases differ, each was projected separately. A linear trendline was fitted to the actual data for foreign-born cases from 1992 through 1997. An exponential decrease in U.S. born cases was fitted to the data, and gave an annual decrease of 6.4% per year.

Both of these trends were projected 20 years into the future, and the projections for each year were added to give the expected total number of cases for each year. The resulting forecast is shown in the following graph:

Twenty-Year Projection



The expected total number of cases in 2017 is 1,355.

Projected Drug Resistant TB Cases in Texas

In general, the trend in drug resistant TB in Texas is going down. In 1997, about 8% of cases

had some form of drug resistance. At the rate this percentage is decreasing, about 4% of the cases will be expected to have drug resistance in 2017, or approximately 54 cases. However, a greater proportion of the drug resistant cases will be multidrug resistant (MDRTB), because the proportion of total cases that are foreign-born will be greater. As of 1997, nearly all cases of MDRTB are foreign-born. Using a two year moving average to smooth out fluctuations in the count of MDRTB cases between 1992 and 1997, there are currently about 20 cases per year of MDRTB. Since there were 653 cases of TB which are foreign-born in 1997, and there are expected to be 972 such cases in 2017 (based on the forecast given above), and since nearly all MDRTB cases are foreign-born, it is expected there will be 30 cases of MDRTB in 2017, a 50% increase.

It is quite possible that this projection of MDRTB and other drug-resistant TB is too low. In 1997, there were at least 200 known MDRTB cases in Mexico within 30 miles of the Border. If Mexico is not able to control the incidence of drug-resistant tuberculosis, this will continue to affect the occurrence of drug-resistant TB in Texas. However, based on current epidemiological science, these data reflect state-of-the-art accuracy with sufficient non-controlled factors that the data should be monitored carefully in the future.

Projected State-managed inpatient bed capacity for TB in Texas

Since the TDH hospitals care for a high percentage of TB patients who are indigent, it is probable that demand will continue for the patient population which has traditionally been served by these hospitals. For example, of the 1,992 TB cases in Texas in 1997, 1,054 cases resulted in hospitalization with 270 of those admissions in TDH hospitals which maintained a combined average daily census of approximately 87 TB patients. There are several complexities which impact estimating total demand for State managed inpatient beds for confirmed TB cases. These include:

- Socioeconomic factors for persons infected with TB.
- Availability of private health insurance to infected persons.
- Availability of inpatient hospital services to medically-indigent infected persons.
- Community support systems to reinforce Directly Observed Therapy.

The regional diversity of Texas and the lack of various combinations of support have continued to create a need for State managed inpatient TB hospital capacity. The proximity to Mexico, with limited public transportation systems and cultural factors, has also contributed to the on-going demand for these beds. As the overall trends develop based on the TDH estimates, it is anticipated that the demand for inpatient hospital beds managed by the State will decline. This trend assumption is further supported by the clinical experts who forecast that more TB treatment will be accomplished on an outpatient basis using Directly Observed Therapy. Therefore, estimating inpatient bed needs for purposes of this report assumes that the existing public and private hospital support for inpatient TB care will continue and that the State will continue to address the population (i.e. indigents who are sometimes non-US citizens) which during the past five to ten years has relied upon the State managed hospitals. The following table illustrates this estimate:

TDH TB Hospitals Average Daily TB Inpatient Census (Including HIV)							
			1997*	2000**	2005**	2010**	2017**
		TB Cases	1992	1810	1592	1453	1355
TDH Combined Hospital Admissions			291	264	232	212	198
Admission Rate			14.6%	14.6%	14.6%	14.6%	14.6%
Average Length of Stay			109.5	111.2	114.0	116.8	121.0
Average TB Daily Census			87	80	72	68	66
Beds Needed at 95% Occupancy			92	85	76	71	69
Current Number of Operating Beds			159				
* Actual							
** Estimate Based on Caseload Assumptions							

Assuming a consistent admission rate of 14.6 percent of reported cases and a growth in average length of stay of 1/2 percent per year due to increased cases of MDRTB, the combined average daily census for the TDH TB facilities is projected to decline from the 1997 level of 87 patients to 66 inpatients by the year 2017. Therefore, future beds needed to serve the TB population now being served would require 87 beds currently, reducing to approximately 70 beds by 2017. It is recommended that at least 75 beds be available for TB related care to allow for increases in lengths of stay (due to more MDRTB cases) and for unexpected spikes in the total number of TB cases.

The third State managed hospital providing TB service at the University of Texas Health Center in Tyler is currently operating 29 inpatient beds dedicated for TB and has the capacity to expand to approximately 50 beds on the same floor and all of these already meet JCAHO standards. The Tyler hospital currently has an average inpatient daily census of approximately 18 patients with regular census peaks to capacity.

Hansen's Disease (Leprosy)

Leprosy is a chronic disease known since biblical times and consistently associated with social stigma. The infection is more recently known as Hansen's Disease, named for Dr. Amauer Hansen of Norway. He discovered in 1873 that this acid fast bacillus was responsible for several different types of skin disease at the same time. The skin infections can result in chronic disabling conditions, primarily loss of sensation to hands and feet similar to that seen in a diabetic. Patients may develop deformities, primarily due to trauma that the patient cannot feel at the time of injury. In addition to skin rashes, the infection causes nerve and eye disability and if left untreated, often results in death, primarily from renal failure.

Hansen's Disease is produced by *Mycobacterium leprae*, a cousin of tuberculosis that affects cooler parts of the body, primarily the skin. The bacterium is known for its extremely slow doubling times of thirteen days, which makes it the slowest of all mycobacteria. Hansen's disease cannot be cultured using conventional laboratory techniques. Skin biopsy and smears of the leprosy lesions are the only way to diagnose the disease, and these must be done yearly to follow response to treatment.

By World Health Organization data, 10 to 15 million cases are estimated worldwide of people with prior Hansen's Disease and approximately 3 million cases of active disease are currently being treated. The U.S. prevalence is estimated at 6 thousand cases, with the US annual incidence estimated at 250 cases. Most new US cases occur among immigrants. Indigenous cases are seen primarily in Texas, Louisiana, and Hawaii. Of all cases of Hansen's disease seen between 1950 and 1991, the U.S. was the country of birth for 1,464 patients. Mexico and Philippines were the country of birth in 1,289 cases each.

In addition, Texas has natural infection of armadillos with Hansen's disease. Infected armadillos are found primarily along the Gulf Coast and up to 15.4% of armadillos randomly captured for surveillance already have the disease. This is especially disturbing as the majority of armadillos infected with *Mycobacterium leprae* are not clinically sick. Transmissions to humans may occur from scratches from armadillo claws and scales or the consumption of armadillo meat. History of eating armadillos has been identified in up to 75 percent of the Hansen's patients treated at the Texas Center For Infectious Disease.

Current demographic characteristics of Hansen's Disease patients in Texas, 1997, includes 418 patients statewide, with 219 patients located either in TDH Region 8 or TDH Region 11. Male to female ratio is approximately 2:1 The majority of patients are 30 to 44. There were 242 Hispanic patients and 105 Anglo patients. Currently, 90 patients are being followed at TCID for outpatient care. Fifteen patients are being cared for at South Texas Hospital through the Hansen's Disease Clinic. Outpatient Hansen's disease services are underwritten by grants to TDH from the US Public Health Service, Gillis W. Long Hansen's Center at Carville, Louisiana. The grants encompass basic Hansen's care as outpatients including: lab work,

medications, and basic support services-surgical, podiatry, and ophthalmologic care. Regionally, Hansen's disease centers are located in San Antonio, Houston, Dallas, and Harlingen. Additionally, patients are seen in private offices of physicians who have TDH recognition to provide Hansen's disease care. Other places having similar programs with recognized Hansen's Disease Centers are California, Hawaii, Miami, Boston, New York City, Puerto Rico and Louisiana. Patients requiring inpatient therapy and who are able to be transported to Carville may be admitted there. In-state admission for emergent Hansen's disease care is not covered by the national grant, but is a state responsibility.

In the outpatient setting Hansen's disease patients require yearly skin biopsy, but may need monthly physician visits to check for complications of the medications. The patients suffer long term problems. Patients require podiatry services such as basic foot care. Trauma and burns are frequent due to sensory neuropathy. Patients may require weekly physician visits for surgical debridement of ulcers on their arms or legs. Complicated patients may require thalidomide for immune reactions in Hansen's disease. TCID's clinic, operating under the supervision of the Gillis W. Long National Hansen's Disease Center, has been the only source of thalidomide for entire south Texas, currently dispensing thalidomide to 15 patients.

Texas has averaged 30 new cases per year with a high of 52 cases in 1992. The cases are equally divided between US born and foreign born. The need for Hansen's services should remain stable with the greatest need in TDH regions 8 and 11. Long term planning should include baseline outpatient services, including surgical, podiatry and ophthalmologic support, with provisions for brief inpatient hospitalization as needed.

South Texas Hospital Breast and Cervical Cancer Control Program

According to a study published by the Texas Department of Health, entitled "Cancer Incidence & Mortality along the Texas-Mexico border," breast cancer is the leading cancer site for both incidence and mortality among females, accounting for 29% of all cancer cases and 18% of all cancer deaths in 1990-92. Among the leading cancer sites, Anglo women had at least twice the incidence and mortality rates for lung and colon cancers than Hispanic women, and 1.5 times or higher rates for breast and ovarian cancers. This pattern is reversed with cervical cancer, however, with Hispanic females experiencing a statistically significant twofold greater rate than Anglo females for both incidence and mortality. Hubbel, F.A. et.al., (1995) states that "Latinos are less likely than Anglo women to have appropriate breast cancer screening for reasons that may include culturally based beliefs as well as socioeconomic factors." Six survey studies conducted by The National Cancer Institute Cancer Screening Consortium for Underserved Women (1995) cited that Hispanic women were among the least likely to have had a screening mammogram within the past two years. The most common reasons were as follows: 1) belief that there is no need to have a mammogram because there is no current symptoms or problems or because there is no family history of cancer, 2) lack of recommendation or referral for a mammogram from a health care provider, and lack of thinking about having a mammogram or the tendency to postpone mammography.

The Comptroller's Special Financial Report (1994) indicates that the four counties of the Lower Rio Grande Valley is one of the most populous rural metropolitan statistical areas (MSA's) in Texas. The report states that South Texas has a 27 percent poverty rate with 35 percent of border residents having incomes below the Federal Poverty Level (FPL). US Census Bureau's Current Population (CPS) indicates the uninsured rate for the South Texas sample population was 28 percent compared to the Statewide sample rate of 23 percent. According to the National Cancer Institute Cancer Screening Consortium for Under-served Women (1995), Hispanic women in Texas have the highest percentage of uninsured women (49%).

Lack of insurance was reported to be even harsher in the Lower Rio Grande Valley, where 44 percent of CPS respondents in Hidalgo Count and 31 percent in Cameron County reported having no insurance. Residents of the McAllen-Edinburg-Mission and Brownsville-Harlingen-San Benito Metropolitan Statistical Areas account for 6 percent of the Texas sample and 10 percent of the uninsured in the sample. Women in poverty have been demonstrated to hesitate to go to a clinic requiring expensive payment or co-payment for services because of the fear of placing a financial burden on the family. Because of the lack of accessibility to health care, these women may find themselves without a place to go to seek help. Child care, transportation, or family support, and/or fear or embarrassment cause many of these women to wait to seek medical assistance for a lesion until there is a crisis, and a diagnosis of late-stage cancer .

The federally-supported Breast and Cervical Cancer Control Program (BCCCP), managed through TDH, provides for screening, definitive diagnosis, treatment, and follow-up for breast and cervical cancer for at risk low-income women who would otherwise not have access funding for these services. The Program's aim is to reduce breast and cervical cancer mortality rates for women not otherwise eligible for another program by providing services targeted at early detection and diagnosis of breast/cervical cancer. The Breast and Cervical Cancer Control Program was originally funded and managed for the 21 counties of TDH Region 11 out of the Region's offices in Harlingen. However, the program was transferred from Region 11 to South Texas Hospital in July, 1996.

Following screening mammography with a positive finding, women who are referred to STH are in a group who were previously referred to UTMB-Galveston, or less often, to UT-M.D. Anderson for definitive breast diagnostic services, surgery, follow-up care and treatment in the event it was required. The Women's Center Clinic at STH serves as a centralized clinic referral area where women can be evaluated, screened and treated for potential breast and cervical cancer. Patients needing evaluation for cervical cancer are seen at the Women's Center GYN Clinic. To evaluate potential breast lesions, cystic aspirations, core biopsies, and preoperative needle biopsies are available at STH. Stereotaxic biopsy is performed by contract with Valley Baptist Medical Center, Harlingen. Follow up for treatment for definitive cancer is most often referred to UTMB-Galveston, where the Department of Surgery reports three-quarters of all referrals for definitive diagnosis following screening mammography are negative for malignancy. Opportunity for definitive diagnosis closer to home is a significant factor in addressing earlier diagnosis and treatment where cure is more possible than in cases of late diagnosis.

Pediatrics

STH is the site for a pediatric clinic serving patients referred from school districts, local health departments, community health centers, private physician offices, and public health providers for child and adolescent services for ages from 1 day to age 18 years. Services range from immunizations to physical examinations, but with particular emphasis on seizure disorders, asthma, thyroid and upper respiratory disorders. Funds for nursing and support staff are shared from the MCH Women's Center general revenue match to Title V funds. The clinic is held three times weekly; no emergency services are available.

The STH Pediatric Clinic also serves as the general pediatric support service for periodic UTHSC-San Antonio subspecialty clinics based at STH for hematology/oncology, endocrinology, specials studies, rheumatology, neurology (seizure/epilepsy) and HIV/AIDS. Pediatric referrals for admissions are to Santa Rosa Medical Center-San Antonio (SRMC) which also provides institutional review board oversight for research with human subjects in those clinics.

In 1995, the presence of the UTHSC-SA pediatric subspecialty clinics were the catalyst for STH inclusion in the UTHSC-SA telemedicine network. After initial funding through UTHSC-SA for installation, room renovation and equipment, telemedicine capabilities have continued to develop with further grants from CDC and the Texas Diabetes Foundation for state-of-the art telemedicine capacities.

Women's Center Gynecology (GYN) Clinic at South Texas Hospital

The program was opened in 1993, using Title V and Breast and Cervical Cancer Control Program (BCCCP) funds to underwrite its operations. Patients treated in the Clinic are referred from TDH contractors and grantees (e.g., community health centers, local health departments, Planned Parenthood centers), UTMB's Dysplasia Clinic (officed at STH), TDH Region 11 clinics, and other STH clinics where preventive screening is done, further service is indicated, and women are not otherwise able to receive locally-provided definitive diagnosis and treatment of cervical cancer and other gynecological problems.

Hispanic women have a rate of cervical cancer 2.5 times that of Anglo women. The Lower Rio Grande Valley is characterized by rapidly growing population that is on average younger, poorer, more Hispanic, and less-insured for healthcare than the rest of Texas. These factors combine to impede access to women of screening, diagnosis, and treatment for their gynecological problems.

The GYN Clinic serves a dual role of providing women's services and training residents. The gynecology services provided at STH are done in conjunction with the UTMB-Galveston, Department of Obstetrics and Gynecology, using third-year residents rotating for six weeks

of on-site practice in the Clinic and in surgery. Full-time faculty is supported by the Program. A wide scope of services for women are offered ranging from PAP smears, hormone replacement, vaginal/cervical biopsies, and screening for sexually transmitted diseases. A total of 17 different types of procedures and exams are done in the GYN clinic. Women needing surgery are not referred to UT-M.D. Anderson or UTMB-Galveston for gynecological services unless they are considered high risk for surgery. The types of surgeries done at STH range from vaginal/abdominal hysterectomies, tubal ligations, rectocele/cystocele repair to ovarian masses and other types of lower risk surgical interventions.

Diabetes Mellitus and Other Chronic Diseases

The Lower Rio Grande Valley has a primarily Hispanic population with as much as a 5.7 fold increased risk of diabetes mellitus. STH houses the Diabetes Screening and Early Intervention Program, a research program which identifies those with diabetes mellitus who are referred for care, and those at risk of developing this disease. Patients diagnosed with diabetes mellitus are referred to the STH Internal Medicine Clinic if they have no private doctor. Patients at risk are offered interventions such as life style modification classes and nutrition classes. Podiatry and dental care are currently underway with plans to add ophthalmology in 1998.

Both the STH and TCID Internal Medicine Outpatient Clinics serve patients with diabetes and other chronic diseases such as hypertension and respiratory disease and who do not have other providers. This allows for further continuity of care for those patients hospitalized at STH who have no primary care and those referred to TCID for further clinical evaluation. The Outpatient Clinic Pharmacy in both hospitals makes available medication to treat diseases and to prevent complications.

Emerging Infectious Diseases

TDH hospitals and their professional staff provide a potentially invaluable resource to confront emerging infectious disease threats, including previously unrecognized infections and other threats such as bioterrorism.